Applicant has re-submitted its Second Preliminary Amendment in compliance with 37 CFR 1.121 within one month of the mailing date of the Office Communication and therefore requests examination on the merits to commence with entry of the Second Preliminary Amendment.

Respectfully submitted,

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Date: February 7, 2002

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on 2/7/02

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Date

PATENT
01-9680

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the application of:
TAKADA, Minoru et al.

Serial Number:	09/874,557	Examiner:	R. Davis
Filed:	June 4, 2001	Art Unit:	1722
For:	INJECTION STRETCH BLOW MOLDING DEVICE WITH TRANSFER STATION AND PITCH CHANGING FOR BLOW MOLDING (AS AMENDED)		

Assistant Commissioner for Patents
Arlington, Virginia 22202

MARKED UP VERSION SHOWING CHANGES MADE

Page 2, Paragraph at line 16 to 23

In the case of the cold parison method, because the preform molding step and the step in which a container is blow molded from this preform are completely [release] independent, the blow molding cycle time is not affected by the injection molding cycle time. However, because the cold parison method involves reheating performs which have been cooled to room temperature the cold parison method is inferior to the hot parison method in its energy efficiency.

Page 2, Paragraph Section at line 24 to 29

In a hot parison (1-stage) [method injection] method, an injection molding machine [which draw] blow molds bottles from performs still containing heat from when

they were injection [molded the] molded. The cycle time of the overall apparatus is determined by the injection molding cycle time, which of all the cycles is the one requiring the most time. Consequently there has been the

Page 3, Paragraph at line 3 to 20

In the case of the hot parison method, although the preform is mold-released at a higher temperature than in the cold parison method, there is a limit on this mold-release temperature and consequently it is not possible to greatly speed up the injection molding cycle. One reason for this is that when the preform mold-release temperature is high, when the injection core mold is released from the preform, a mold-release phenomenon called lifting, wherein the preform sticks to the core mold, occurs. Also, after the injection core mold is released from the preform, because there is no longer any member restricting deformation of the preform, deformation caused by temperature nonuniformity and thermal contraction and the like make it impossible for performs conforming to the design to be ejected. Furthermore, when the cooling effected by the injection core mold is inadequate, crystallization caused by inadequate cooling occurs, particularly at the inner wall of the preform, and a preform of which the trunk portion is opaque is ejected.

Page 5, Paragraph at line 3 to 20

When in order to increase the throughput the number N of performs injection molded simultaneously is increased, the same number N of cavities conforming to the external shape of the bottles being manufactured have to be formed in the blow cavity mold. Of the molds used in a blow molding machine the blow cavity mold is the most expensive, and the cost of this blow cavity mold increases roughly in proportion to the number of cavities in it. Even if a mold is expensive, if its operation rate is high then it

can be used [cost-effectively;] cost-effectively. [however] However, because as described above the cycle time of the overall apparatus depends on the injection molding cycle time and cannot be shortened, the operation rate of each cavity in the blow cavity mold has unavoidably been low. Also, when the number of bottles blow molded simultaneously increases, not only the number of cavities in the blow mold but also the number of drawing rods and blow core molds and mechanisms for supporting and driving these increases, and this has resulted in increases in the size and cost of the apparatus.

Page 6, Paragraph at line 21 to 25

Another object of the invention is to provide a highly efficient injection stretch blow molding apparatus and method [with which while reducing] which reduces costs by reducing the number of cavities in the [blow mold the operation rate of the blow mold can be increased] blow mold while at the same time increases the operation rate of the blow mold.

Page 10, Paragraph at line 10 to 20

According to another aspect of the invention, an injection stretch blow molding apparatus [comprises] includes:

a preform molding station for injection molding performs;

a blow molding station for stretch blow molding the performs into containers; and

a transfer station for transferring the performs from the preform molding station to the blow molding station,

wherein the preform molding station comprises:

a first circulatory carrier for intermittently circulatorily carrying along a first carrying path an injection core mold having [N(N≥2)] N (N>2) of core bins disposed apart;

Page 11, Paragraph at line 10 to 13

According to another aspect of the invention, an injection stretch blow molding method for molding containers from performs retaining heat from when the performs were injections molded, [comprising] includes the steps of:

Page 12, Paragraph at line 1 to 14

[According to these inventions, the] The inventions provide the following operations and effects in addition to those [of the inventions as] described above: Because the number n of performs simultaneously blow molded is made smaller than the number N of performs simultaneously injection molded, fewer cavities are required in the blow mold and mold costs, molds being consumable items, can be greatly reduced. Also, because fewer blow core molds, stretching rods, and mechanisms for supporting and driving these are required, the apparatus can be made more compact and cheaper. Furthermore, because N simultaneously molded performs are blow molded n (n≤N) at a time over a plurality of blow molding cycles within the shortened injection molding cycle time, the operating rate of the n cavities in the blow cavity mold increases.

Page 12, Paragraph at line 15 to 24

Here, a heating section for heating the preforms being carried to the blow molding section can be provided. When this is done, the preforms can be brought to a temperature suitable for blow molding by cooling performed by the injection molds and reheating of the cooled preforms, and the temperature stability from cycle to cycle therefore increases.

Also, even though N simultaneously injection molded performs are blow molded n performs at a time [over] <u>during</u> (N/n) blow molding cycles, [control reducing] the temperature variation among blow molding cycles can easily be [carried out] <u>controlled and reduced</u>.

<u>Page 16, Paragraph Section at line 11 to 29</u>

According to experiments carried out by the present inventors, in the case of a general-purpose medium-sized container of capacity 1 to 3 liters having a relatively small mouth (the diameter of the opening in the neck portion 2 being about 28 to 38mm) for which the market demand is large, the ratio of the simultaneous molding numbers N, n should ideally be set to N:n = 3:1. That is, it has been found that in the case of this invention wherein the performs continue to be cooled by the injection core mold even after the performs are removed from the injection cavity mold and then blow molded thereafter, the time required for the injection molding of a preform for a general-purpose medium-sized container is shortened to approximately ¾ of that in the case of a conventional injection stretch blow molding apparatus, and an injection molding cycle time of approximately 10 to 15 seconds is sufficient. A blow molding cycle time, [on the other hand] <u>by contrast</u>, of 3.6 to 4.0 seconds is sufficient. Therefore, if this injection molding cycle time is T1 and the blow molding cycle time is T2, the ratio T1:T2 is roughly 3:1, and to mold

<u>Page 18, Paragraph at line 13 to 26</u>

According to the invention, although the region below the neck portion when the preform is upright is the nearest to the cavity surface of the blow cavity mold, it is a region which is to be draw orientated relatively [much] <u>substantially</u>. By heating this

region with the second heaters on either side of the preform, it can be heated to a higher temperature than the trunk portion region heated by the first heaters disposed on one side only, and a high drawing orientation degree can be secured. Also, because the first heaters are disposed on one side only, the arrangement [is saving] is space saving. Furthermore, because the efficiency with which the region below the neck is heated increases, there is the benefit that the heating time can be shortened and the overall length of the heating section can be made short.

Page 20, Paragraph Section at line 20 to 29

According [to the invention] to one embodiment of the invention, [as set forth in claim 20] by a standby section before the blow molding section, the temperature distributions in the synthetic resin performs, which have poor thermal conductivity, can be moderated. Normally, because heating in the heating section is carried out from around the performs, the inner wall temperature of the performs becomes lower than the outer wall temperature. By having at least the number of performs simultaneously blow molded standby after being heated in order to moderate the resulting temperature gradients therein, the

Page 26, Paragraph at line 5 to 21

The transfer station 200 transfers the performs 1 ejected from the preform ejecting section 16 of the preform molding station 10 to the preform receiving section 304 of the blow molding station 300. In the preform ejecting section 16 of the preform molding station [10 N] 10, N performs 1, i.e. the number of performs 1 simultaneously molded in the injection molding section 14, are ejected at a time, but in the transfer station [200 n] 200, n performs 1, i.e. the number of performs 1 simultaneously molded in the blow

molding section 310 of the blow molding station 300, are transferred at a time. In the apparatus of this preferred embodiment, four performs 1 simultaneously ejected by the preform ejecting section 16 are transferred one at a time to the preform receiving section 304. Also, whereas in the preform molding station 10 the performs 1 are injection molded in an upright state, in the transfer station 200 the performs 1 are turned upside-down and transferred to the blow molding station 300 in an inverted state.

Page 27, Paragraph at line 12 to 23

As shown in Fig. 2 to Fig. 4, the rotary disc 30 constituting the first circulatory carrier is rotatably mounted at the underside of the upper clamping plate 22. As shown in Fig. 7, this rotary disc 30 is fixed to a rotational shaft 34 rotationally driven by a rotary actuator 32 fixed to the upper clamping plate 22. As shown in Fig. 5, which is an underside view of the rotary disc 30, the two injection core molds 50 and the two neck cavity molds 60 are mounted on the rotary disc 30 in positions corresponding to the injection molding section 14 and the preform ejecting section 16. The details of the injection core molds 50 and the neck cavity molds 60 will be discussed [in detail] later.

Page 27, Paragraph Section at line 24 to 29

As shown in Fig. 2 and Fig. 4, the injection molding section 14 is provided with a hot runner mold 40 [with which a nozzle of the injecting apparatus 12 nozzle touches] which touches and communicates with a nozzle of the injecting apparatus 12 and the injection cavity mold 42 is mounted on this hot runner mold 40. This injection cavity mold 42 has a cavity for each of the N performs 1 simultaneously molded in the injection

Page 29, Paragraph Section at line 1 to 9
plates 66 which support the undersides of the ends of the neck fixing plate 64. The split plates 64a and 64b are kept normally closed by springs 64c shown in Fig. 5. [As shown in Fig. 5, a] A wedge hole 64d is provided at each end of the split plates 64a and 64b. After the neck fixing plate 64 has been carried into the preform ejecting section 16, the split plates 64a and 64b are opened by being driven apart along the guide plates 66 by split plate opening cams 108, which will be further discussed later, driven into the wedge holes 64d.

Page 32, Paragraph Section at line 21 to 29
The clamping cylinder 28 is driven and the upper clamping plate 22 is thereby driven down, whereby the injection core mold 50 and the neck cavity mold 60 are clamped to the injection cavity mold 42. After the clamped state shown in Fig. 4 is reached, by a screw inside the injecting apparatus 12 being advanced and rotated, the [preforms] preform 1 injection molding material, for example polyethylene terephthalate (PET), is injected by way of the hot runner mold 40 into the cavity bounded by the molds 42, 50 and 60, and the preforms 1

Page 33, Paragraph Section at line 19 to 29
The timing at which this mold-release starts in the injection molding section 14 can be made considerably earlier than a conventional mold-release starting [timing] time. In other words, the cooling time of the preforms 1 in the injections molding section 14 can be shortened. This is because even after the preforms 1 have been released from the injection cavity mold 42 the core pins 52 of the injection core mold 50 remain inside the preforms 1 and deformation of the preforms 1 accompanying their thermal contraction

can be prevented. Therefore, the mold-release temperature of the preforms 1 in the injection molding section 14 only has to be low enough for

Page 34, Paragraph Section at line 1 to 15

a skin [later thick] layer, thick enough for the shape of the preforms 1 to be maintained after they are released from the injection cavity mold [42 to] 42, to form at the outer surfaces of the preforms 1, and can be higher than conventional mold-release temperatures. Even if the mold-release temperature is high like this, because the cooling causes the preforms 1 to contract around the core pins 52 of the injection core mold 50, mold-release from the injection cavity mold 42 can be carried out relatively smoothly, and [preform 1 mold-release] preform mold release problems do not occur. Also, because in the injection molding section 14 withdrawal of the core pins 52 is not carried out, even if the preforms 1 are mold-released at a high mold-release temperature, the mold-release problem of the lower ends of the preforms 1 being lifted together with the core pins 52 does not occur.

Page 34, Paragraph at line 16 to 29

The clamped state of the injection core mold 50 and the neck cavity mold 60 with respect to the preforms 1 released from the injection cavity mold 42 is maintained by the core fixing plate 56 and the neck presser plate 65 being kep in contact with each other by the return springs 74. This clamped state of the injection core mold 50 and the neck cavity mold 60 is maintained through the subsequent [preforms 1 carrying] preform carrying step and until in the preform ejecting section 16 the injection core mold 50 is released from the preforms 1. Cooling of the preforms 1 is possible throughout the time

during which this clamped state of the injection core mold 50 and the neck cavity mold 60 is maintained.

[Preforms 1 Carrying Step] <u>Preform Carrying Step</u>

The preforms 1 are carried from the injection molding

<u>Page 35, Paragraph Section at line 1 to 7</u>
section 14 to the preform ejecting section 16 by the rotary actuator 32 being driven and the rotary disc 30 constituting the first circulatory carrier being rotated thereby through 180°. During this [preforms 1 carrying] <u>preform carrying</u> step, it is possible for cooling of the preforms 1 by the coolant circulating through the injection core mold 50 and the neck cavity mold 60 to continue without interruption.

<u>Page 35, Paragraph at line 8 to 26</u>
Generally, when the preforms 1 are mold-released at a high temperature, crystallization occurs due to inadequate cooling and the wall surfaces of the preforms 1 become nontransparent, and particularly when PET is being used to make transparent containers this is a fatal defect. According to experiments carried out by the present inventors, this crystallization and loss of transparency of the preforms 1 accompanying inadequate cooling is particularly marked at the inner [wall sides] <u>walls</u> of the preforms 1. This is because at the inner [wall side] <u>walls</u> of a preform 1 there is less surface area in contact with the mold and consequently the inner wall is more liable to be inadequately cooled than the outer wall. Also, when as in the past the injection cavity mold 42 and the injection core mold 50 are released from the preforms 1 in the injection molding section, the inner wall [side] is more liable to be inadequately cooled than the outer wall because

the heat-radiating surface area at the inner wall [side] of the preform 1 is smaller than at the outer wall [side] and furthermore heat is confined in the interior of the preform 1.

Page 37, Paragraph at line 8 to 24

This separation of the neck cavity mold 60 is carried out by the neck presser plate [65 kept] 65, which as been kept in contact with the core fixing plate 56 by the urging force of the return [springs 74 being] springs 74, being lowered by the neck mold-release driver 80. When the first cylinder 82 of the neck mold-release driver 80 is driven, the pushing force thereof transmitted through the first piston rod 82a, the first raising and lowering plate 86, the presser drive rods 88 and the driven rods 68 causes the neck fixing plate 64 to be pressed against the neck presser plate 65 and be driven downward as shown in Fig. 6 and Fig. 10. At this time, because the preforms 1 have their neck portions 2 held by the neck cavity mold 60, the preforms 1 are also driven downward together with the neck fixing plate 64 and the neck cavity mold 60. Consequently, the separation of the neck cavity mold 60 from the injection core mold 50 results in the injection core mold 50 being released from the preforms 1.

Page 38, section heading at line 14

[Preforms 1 Ejection] Preform Ejection Step in Preform Ejecting Section 16

Page 39, Paragraph at line 5 to 24

In the state before the split plate opening cams 108 are driven downward, in order to avoid the split plate opening cams 108 interfering with the rotation of the rotary disc 30 it is necessary that their ends stop within the thickness of the upper clamping plate 22. [On the other hand] By contrast, because the neck fixing plate 64 which is driven open by these split plate opening cams 108 is in the farthest position from the rotary disc 30, the

downward stroke of the split plate opening cams 108 is long. In this preferred embodiment, because the second cylinders 102 which drive these split plate opening cams 108 are mounted on the first raising and lowering plate 86 driven by the first cylinder 82 and because before the split plate opening cams 108 are driven the first raising and lowering plate 86 is driven, the actual downward stroke through which the split plate opening cams 108 are driven by the second cylinders 102 is short. As a result, the installation height of the second cylinders 102 can be made low, the overall height of the injection molding apparatus [an] <u>can</u> be made low, and an apparatus advantageous [from the points of] <u>for</u> view of transportation and installation can be provided.

<u>Page 45, Paragraph at line 13 to 29</u>

Next, the constitution of the inverting and handing over mechanism 230 will be described with reference to Fig. 4 and Fig. 13 to Fig. 15. This inverting and handing over mechanism 230 has two neck holding mechanisms 232 corresponding to the number n = 2 of preforms simultaneously blow molded in the blow molding section 310 shown in Fig. 21 (see Fig. 14). The neck holding mechanisms 232 each have an open/closeable pair of neck holding members 234 which hold the neck portion 2 of the preform 1. As shown in Fig. 15, these two neck holding mechanisms 232 are mounted on a support table 236, and this support table 236 is linked to a rod 238a of a second raising and lowering drive device 238 comprising [and] <u>an</u> air cylinder or the like. As a result, the two neck holding mechanisms 232 are movable vertically through a vertical stroke e shown in Fig. 4. In order to make this vertical movement smooth, for example two guide rods 240 are provided and guided by guide portions 242.

Page 47, Paragraph Section at line 1 to 22

mechanisms incorporated into the neck holding mechanisms 232 close the pairs of neck holding members 234, and the neck portions 2 of the preforms 1 are held by these neck holding members 234. Then the preforms 1 are inverted. Before that, however, to prevent the preforms 1 from interfering with other members, the neck lower portion holding part 218 is withdrawn to the right through the moving stroke a (see Fig. 4) and by the third slider 248 being moved to the left through the moving stroke c (see Fig. 4) the two neck holding mechanisms 232 are moved to the left. After that, by the preforms 1 being rotated through 180° by the inverting drive device 252, the preforms 1 reach the position shown with chain lines in Fig. 13. Then, by the two neck holding mechanisms 232 being lowered by the second raising and lowering drive device 238 through the stroke 3 (see Fig. 4), the preforms 1 can be placed on carrier members 330 positioned in the preform receiving section 304 of the blow molding station 300. After that, the neck holding mechanisms 232 are opened and moved through the vertical stroke e and the transverse [stoke] stroke c shown in Fig. 4 whereby the neck holding mechanisms 232 are moved away from the preforms 1 and returned to their standby position shown with chain lines in Fig. 13.

Page 47, Paragraph Section at line 23 to 29

When the above transfer operation is carried out in the preferred embodiment apparatus shown in Fig. 21 wherein the number of simultaneously blow molded preforms 1 is [n = 2, n = 2] two (n = 2), then two preforms 1 are transferred simultaneously. The transferred two preforms 1 are handed over to carrier members 330 in two receiving positions 260. At this time, the pitch P2 at which the neck holding mechanisms 232 receive the two preforms 1

Page 50, Paragraph at line 15 to 27

[On the other hand] By contrast, in all parts of the carrying path outside the blow modling section 310, for example as shown in Fig. 19 showing the heating section 306, the carrier base 324 is provided below the carrying path. Upper surfaces of this carrier base 324 constitute cam surfaces 324a. Portions of the rails 326 disposed in the heating section 306 are so disposed that they cover the upper portions of the cam followers 338 and prevent the cam followers 338 from escaping from their travel paths. Because if the carrier base 324 were provided in the blow molding section 310 it would not be possible for a drawing rod and a blow core mold to be inserted from below into the preform 1, such a construction is not used.

Page 51, Paragraph at line 5 to 24

The driving sprocket 320a repeats an intermittent carrying movement wherein it moves by an amount corresponding to one pitch of the carrier members 330 fixed to the carrier chain 322 at a predetermined pitch and then stops for a predetermined period of time. By the preform 1 being received in an inverted state by the preform receiving section 304 of the blow molding station 300 the preform 1 is placed on the carrying surface 344 of the carrier member 330 and the carrying pin 346 is inserted into the neck portion 2 of the preform 1. [When after] After that the driving sprocket 320a is driven and [rotates the] rotates, so the carrier chain 322 meshing with the sprockets 320a to 320d moves and the carrier members 330 are thereby moved by one pitch. By this carrying operation being repeated, the preforms 1 received in the preform receiving section 304 are carried through the heating section 306 and the standby section 308 to the blow molding section 310, and here they are drawn and blow molded into bottles 6. After that

the bottles 6 on the carrier members 330 are carried to the bottle ejecting section 312, and here the bottles 6 are ejected to outside the apparatus.

Page 52, Paragraph at line 13 to 27

Inside the heating box cover 350 of the heating section 306 there are provided first to fourth barlike heaters 352a to 352d constituting a first heater set disposed spaced apart in the axial direction of the preform 1. The barlike heaters 352a to 352d are for example infrared heaters, and extend in the [preform 1 carrying] preform carrying direction inside the heating box cover 350. The first and second barlike heaters 352a and 352b are partly surrounded by a [focussing] focusing reflecting plate 354a, and heat especially the bottom portion 3 of the preform 1 with radiant heat. The third and fourth barlike heaters 352c and 352d are partly surrounded by a [focussing] focusing reflecting plate 354b and heat especially the vicinity of the trunk portion 4 of the preform 1 with radiant heat. As shown in Fig. 19, a reflecting plate 356 is disposed on the other side of the carrying path facing the barlike heaters 352a to 352d.

Page 53, Paragraph Section at line 1 to 9

disposed one on either side of the [preform 1 carrying] preform carrying path. These barlike heaters 352e and 352f are positioned at such a vertical height that they face the vicinity of the neck portion 2 of the preform 1 which is draw orientated in the blow moldilng section 310. The region of the preform 1 heated by these fifth and sixth barlike heaters 352e and 352f is the region which is immediately below the neck portion 2 when the preform 1 is upright, and will hereinafter be called the region below the neck 4a.

Page 54, Paragraph at line 7 to 21

As a result, when the preform 1 is carried into the heating section 306, the bottom portion 3 and the trunk portion 4 of the preform 1 [receive] receives radiant heat both from the barlike heaters 352a to 352d disposed on one side of the carrying path and from the reflecting plate 356 disposed on the other side of the carrying path, and because the preform 1 is rotated it receives heat substantially uniformly in the circumferential direction and therefore is heated uniformly in the circumferential direction. Also, the region below the neck 4a of the preform 1 is amply heated by the fifth and sixth barlike heaters 352e and 352f disposed close to the preform 1 on either side of the carrying path, and furthermore the rotation of the preform 1 ensures that this region below the neck 4a also is heated substantially uniformly in the circumferential direction.

Page 55, Paragraph Section at line 1 to 16

direction, direction A, there would be no relative movement between the autorotation sprocket 348 on the carrier member 330 side and the autorotation drive chain 358, and the preform 1 would not rotate at all. Even if the running speeds of the carrier chain 322 and the autorotation drive chain 358 were to be changed, depending on [the sizes of the speeds the] the speeds, the rotation of the preform 1 would either be extremely slow or would be reverse rotation. These situations will not occur if the autorotation drive chain 358 is driven at a higher speed than the carrier chain 322, but normally it is not desirable to rotate it at high speed [in this way for reasons relating to moment]. When rotated at high speed, if the preform 1 is slightly bent, this bend will be made greater by the strong moment it undergoes and this will cause uneven heating of the preform 1 and adversely affect the thickness distribution of the bottle 6.

Page 55, Paragraph at line 17 to 24

Therefore, in the preferred embodiment shown in Fig. 20, by having the carrier chain 322 and the autorotation drive chain 358 run in opposite directions, when the preform 1 is carried in direction A the direction of its autorotation will always be the arrow C direction, and the problems described above are eliminated. The preform 1 rotates faster while it is being moved than when it is at a [preform 1 stopping] preform stopping position.

Page 56, Paragraph Section at line 1 to 17

refers to the time that the preform 1 spends moving through the distances L1, L2 and L3 (L1+L2+L3 = the heating zone length L), as shown in Fig. 20, and the time the preform 1 spends stopped at the two positions shown in Fig. 20 L1 is the distance over which the preform 1 is carried between entering the heating zone and first stopping position; L2 is the distance between [the two stopping] the two (first and second) stopping positions; and L3 is the distance over which the preform 1 is carried between the second stopping position and leaving the heating zone. In this preferred embodiment, by making the number of turns through which the preform 1 autorotates in this carrying time and stopped time a substantially integral number of turns, the radiant heat from both sides of the [preform 1 carrying] preform carrying path can be received substantially uniformly in the circumferential direction of the preform 1 and temperature variation in the circumferential direction of the preform 1 can thereby be prevented.

Page 58, Paragraph Section at line 1 to 19

the heating section and the carrying pitch is made larger when they enter the blow molding section. The reason why the carrying pitch is made smaller in the heating is [that] because it is necessary to heat the preforms all the way from room temperature to

the blow molding temperature the total number of preforms inside the heating section is made as large as possible in order to keep the apparatus as small as possible. The reason why the carrying pitch is made larger in the blow molding [section, on the other hand] <u>section</u> is that when a plurality of preforms are to be blow molded simultaneously the distance between the preforms has to made at least greater than the maximum width of the molded product. Also, preforms about to be carried into the blow molding section and preforms having just been carried out of the blow molding section have to standby outside the blow molding clamping apparatus of the blow molding section. Because of this, in conventional 1-stage molding machines the carrying pitch has to be changed midway around the carrying path and the apparatus consequently is complex.

<u>Page 62, Paragraph at line 17 to 25</u>

A pair of split molds 378a and 378b constituting the blow mold 378 are mounted on these two blow mold clamping plates 374. In the case of the preferred embodiment apparatus shown in Fig. 1, because the number n of bottles simultaneously blow molded is n=1, a cavity for one bottle is formed in the pair of split molds 378a and 378b. In the case of the preferred embodiment apparatus shown in Fig. 21, because the number n of bottles simultaneously blow molded is [n = 2] <u>two (n = 2),</u> cavities for two bottles are formed in the pair of split molds 378a and 378b.

<u>Page 63, Paragraph at line 5 to 23</u>

Thus in this preferred emodiment, while raising productivity by injection [molding N = 4] <u>molding four (N = 4)</u> preforms 1 simultaneously in the injection molding section 14 of the preform molding station 10, by only [molding n = 1] <u>molding one (n = 1)</u> bottle 6 at a time in the blow molding section 310 it is possible to raise the operation

rate of the blow cavity mold 378. Also, by reducing the number of cavities in the blow cavity mold 378, which is a relatively expensive type of mold, mold costs, molds being consumable items, can be reduced. Furthermore, in this preferred [embodiment apparatus] <u>embodiment of the apparatus</u>, because in the preform molding station 10 the preforms 1 are amply cooled before they are released from the injection molds, and because [enough] <u>sufficient</u> cooling time is provided thereafter for the temperature difference between the inner and outer walls of the preforms 1 to be moderated before the preforms 1 are heated to the blowing temperature, the uniformity of the temperature distribution of the retained heat in the preforms 1 can be increased and the stability of the blow molding can be greatly improved.

<u>Page 64, Paragraph Section at line 1 to 18</u>

holding mechanism 390 having for example a similar construction to that of the neck holding mechanisms 232 employed in the inverting and handing over mechanism 230. This neck holding mechanism 390 holds the neck portion of the inverted bottle 6 by means of a pair of holding members. As shown in Fig. 3 and Fig. 4, there are also provided a raising and lowering drive device 392 which raises and lowers this neck holding mechanism 390 and an inverting drive device 394 which inverts the neck holding mechanism through an angle of 180°. By the neck holding mechanism 390 being raised by the raising and lowering drive device 392, the neck portion of the bottle 6 is pulled upward off the carrying pin 346 of the carrier member 330. After that, by this holding mechanism 390 being rotated through 180° by the inverting device 394, the bottle 6 is brought into an upright state to one side of the machine bed 8, and by the pair of holding

members of the neck holding mechanism then being opened, the bottle 6 is discharged [to outside] from the apparatus.

Page 64, Paragraph at line 20 to 24

Fig. 21 is a plan view of a preferred embodiment apparatus wherein the simultaneous molding numbers are N = 6, n = 2. The preferred embodiment shown in Fig. 21 differs from the preferred embodiment [apparatus] shown in Fig. 1 in the following [points] ways:

Page 64, Paragraph Section at line 25 to 29

First, because the blow molding section 310 [is to] is set to simultaneously blow mold two bottles 6 at a time from among the N = 2 simultaneously injection molded preforms, the blow cavity mold 378 has two blow cavities [spaced an] spaced at an array pitch P3 apart. The array pitch at which the carrier members 330

Page 65, Paragraph Section at line 1 to 16

carried by the second circulatory carrier 302 are spaced apart is the same pitch as the array pitch P3 of the blow cavities in the blow molding section 310. Also, the total number of carrier members fitted to the carrier chain 322 constituting the second circulatory carrier 302 is twenty, twice as many as in the case of the preferred embodiment shown in Fig. 1. Enough preforms 1 for two blow molding cycles, 2 x n = 4 preforms 1, are stopped inside the heating section 306. In the standby section 308, enough preforms 1 for one blow molding cyle, n = 2 preforms 1, are made to standby. The carrier chain 322 and the carrier members 330 used in the [preferred emodiment] apparatus of Fig. 21 are the same as those used in the [preferred embodiment] apparatus

shown in Fig. 1, and it is only the positions and pitch at which the carrier members 330 are fitted to the carrier chain 322 that are different.

Page 65, Paragraph Section at line 17 to 29

In the [preferred embodiment apparatus shown in Fig. 21, in the] transfer station [200, the] 200 in Fig. 21, the number n = 2 of preforms 1 simultaneously blow molded in the blow molding section 310 are simultaneously transferred. [For this] For accomplishing this, a transfer pitch converting operatio, which will now be explained with reference to Fig. 22, is necessary. In Fig. 22, six preforms 1 simultaneously injection molded in the injection molding section 14 of the preform molding station 10 are shown as [preform 1a to preform 1f] preforms 1a to 1f. In Fig. 22, the first row on the right shows the array pitch of the preforms 1 injection molded in the preform molding station 10. The array pitch of the preforms 1 at this time is the same as the array pitch P1 of the core pins 52 of the injection molding section 14. The

Page 66, Paragraph at line12 to 26

Here, in the transfer station 200, when the two preforms 1 are transferred by the two pairs of neck holding members 234, first, for example the first and fourth preforms 1a and 1d are held. That is, the two preforms1a and 1d are held and the two preforms 1b and 1c are [ignored this] ignored at this time. As a result, the array pitch P2 of the neck holding members 234 at this time is P2 = 3 x P1. [This pitch conversion from the pitch P2 to the pitch P3 is carried out by the array pitch of the two neck holding mechanisms 232 being converted by the pitch change drive device 254 show in Fig. 14. Similarly thereafter, by the second and fifth preforms 1b and 1e being transferred and then the third and sixth preforms 1c and 1f being simultaneously transferred after that, the

operation of transferring of the six simultaneously molded preforms 1 is completed.] Pitch conversion from pitch P2 to pitch P3 is carried out by changing the pitch of the two neck holding mechanisms 232 between P2 and P3 using the pitch change drive device 254 shown in Fig. 14. Thereafter, in the same way, the second and fifth preforms 1b and 1e are transferred and then the third and sixth preforms 1c and 1f are transferred after that. Thus, the operation of transferring of the six simultaneously molded preforms 1 is completed.

Page 67, Paragraph Section at line 1 to 3

P1 to the pitch [P3 being performed and two preforms being held] P3. Two preforms are gripped and transferred at a time while the one preform between them is ignored until the next time.

Page 67, Paragraph at line 4 to 23

In the case of the preferred embodiment apparatus shown in Fig. 21, the ratio (N/n) of the simultaneous molding numbers N and n is 3. According to studies carried out by the present inventors, in the case of general-purpose medium-sized containers of capacity [about 1 to 3 liters] about one to three (1 to 3) liters having relatively small mouths (the diameter of the opening of the neck portion 2 being about 28 to 38mm), the ratio of the simultaneous molding numbers N, n should ideally be set to N:n = 3:1. The reason for this is as follows: The size of a preform for molding a general-purpose medium-sized container, although some elements do vary according to the application, is within a substantially fixed range. This is because the preform size is determined by the drawing factor necessary to botain the drawing characteristics of polyethylene terephthalate (PET) resin and the drawing factor necessary for molding stability.

Although there is some variation depending on the use for which the container is intended, research carried out by the present inventors has shown that the maximum thickness of the trunk portion 4 of a preform 1 used for a general-purpose medium-sized container lies within the range 3.0 to 4.0mm.

<u>Page 69, Paragraph Section at line 21 to 29</u>

In this preferred embodiment, when such a situation arises, the preforms 1 continuing to be injection molded in the preform molding station 10 are discharged to the side of the machine bed 8 through the above-mentioned preform dropout opening 8a, the ~~cute 8b and discharge opening 8c instead of being transferred to the blow molding station~~ 300 by the transfer station 200. This [preform 1 discharging] <u>preform discharging</u> operation can for example be carried out by the pair of neck holding members 234 of the inverting and handing over mechanism 230